

dust", "Silica, crystalline tripoli (as quartz), respirable dust", and "Silica, crystalline tridymite, respirable dust";

- b. Under the "MINERAL DUSTS" heading of the table, revising the entry for "Silica: Crystalline Quartz";
- c. Adding footnote 5; and
- d. Add footnote p.

The revisions and additions should read as follows:

§ 1915.1000 Air contaminants.
* * * * *

TABLE Z—SHIPYARDS

Substance	CAS No. ^d	ppm ^a *	mg/m ³ b *	Skin designation
Silica, crystalline, respirable dust				
Cristobalite; see 1915.1053	14464-46-1			
Quartz; see 1915.1053 ⁵	14808-60-7			
Tripoli (as quartz); see 1915.1053 ⁵	1317-95-9			
Trydimite; see 1915.1053	15468-32-3			

MINERAL DUSTS

Substance	mppcf ⁽ⁱ⁾
SILICA:	
Crystalline	250 ^(k)
Quartz. Threshold Limit calculated from the formula ^(p)	% SiO ₂ +5

⁵ See Mineral Dusts table for the exposure limit for any operations or sectors where the exposure limit in § 1915.1053 is stayed or is otherwise not in effect.

* The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

^a Parts of vapor or gas per million parts of contaminated air by volume at 25 °C and 760 torr.

^b Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

^p This standard applies to any operations or sectors for which the respirable crystalline silica standard, 1915.1053, is stayed or otherwise is not in effect.

■ 7. Add § 1915.1053 to read as follows:

§ 1915.1053 Respirable crystalline silica.

The requirements applicable to shipyard employment under this section are identical to those set forth at § 1910.1053 of this chapter.

PART 1926—SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

Subpart D—Occupational Health and Environmental Controls

■ 8. The authority citation for subpart D of part 1926 is revised to read as follows:

Authority: Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704); Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); and Secretary of

Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 6-96 (62 FR 111), 3-2000 (65 FR 50017), 5-2002 (67 FR 65008), 5-2007 (72 FR 31160), 4-2010 (75 FR 55355), or 1-2012 (77 FR 3912), as applicable; and 29 CFR part 1911.

Sections 1926.58, 1926.59, 1926.60, and 1926.65 also issued under 5 U.S.C. 553 and 29 CFR part 1911.

Section 1926.61 also issued under 49 U.S.C. 1801-1819 and 6 U.S.C. 553.

Section 1926.62 also issued under section 1031 of the Housing and Community Development Act of 1992 (42 U.S.C. 4853).

Section 1926.65 also issued under section 126 of the Superfund Amendments and Reauthorization Act of 1986, as amended (reprinted at 29 U.S.C.A. 655 Note), and 5 U.S.C. 553.

- 9. In § 1926.55, amend appendix A:
- a. By revising the entries for "Silica, crystalline cristobalite, respirable dust",

"Silica, crystalline quartz, respirable dust", "Silica, crystalline tripoli (as quartz), respirable dust", and "Silica, crystalline tridymite, respirable dust";

- b. Under the "MINERAL DUSTS" heading of the table, by revising the entry for "Silica: Crystalline Quartz" in column 1;

- c. Adding footnote 5; and

- d. Adding footnote p.

The revisions and additions read as follows:

§ 1926.55 Gases, vapors, fumes, dusts, and mists.
* * * * *

Appendix A to § 1926.55—1970 American Conference of Governmental Industrial Hygienists' Threshold Limit Values of Airborne Contaminants

THRESHOLD LIMIT VALUES OF AIRBORNE CONTAMINANTS FOR CONSTRUCTION

Substance	CAS No. ^d	ppm ^a *	mg/m ³ b *	Skin designation
Silica, crystalline, respirable dust				

employer shall fully and properly implement the engineering controls, work practices, and respiratory

protection specified for the task on Table 1, unless the employer assesses and limits the exposure of the employee

to respirable crystalline silica in accordance with paragraph (d) of this section.

TABLE 1—SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤4 hours/shift	>4 hours/shift
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None.
(ii) Handheld power saws (any blade diameter).	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions: —When used outdoors —When used indoors or in an enclosed area	None APF 10	APF 10. APF 10.
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less).	For tasks performed outdoors only: Use saw equipped with commercially available dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.	None.	None.
(iv) Walk-behind saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions: —When used outdoors —When used indoors or in an enclosed area	None APF 10	None. APF 10.
(v) Drivable saws	For tasks performed outdoors only: Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None.
(vi) Rig-mounted core saws or drills.	Use tool equipped with integrated water delivery system that supplies water to cutting surface. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None.
(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills).	Use drill equipped with commercially available shroud or cowling with dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. Use a HEPA-filtered vacuum when cleaning holes.	None	None.
(viii) Dowel drilling rigs for concrete	For tasks performed outdoors only: Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filter-cleaning mechanism. Use a HEPA-filtered vacuum when cleaning holes.	APF 10	APF 10.
(ix) Vehicle-mounted drilling rigs for rock and concrete.	Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector. OR Operate from within an enclosed cab and use water for dust suppression on drill bit.	None None	None. None.
(x) Jackhammers and handheld powered chipping tools.	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact: —When used outdoors —When used indoors or in an enclosed area OR Use tool equipped with commercially available shroud and dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None APF 10	APF 10. APF 10.

TABLE 1—SPECIFIED EXPOSURE CONTROL METHODS WHEN WORKING WITH MATERIALS CONTAINING CRYSTALLINE SILICA—Continued

Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤4 hours/shift	>4 hours/shift
(xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials.	Operate equipment from within an enclosed cab When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None None	None. None.
(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: Demolishing, abrading, or fracturing silica-containing materials.	Apply water and/or dust suppressants as necessary to minimize dust emissions. OR When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None None	None. None.

(2) When implementing the control measures specified in Table 1, each employer shall:

(i) For tasks performed indoors or in enclosed areas, provide a means of exhaust as needed to minimize the accumulation of visible airborne dust;

(ii) For tasks performed using wet methods, apply water at flow rates sufficient to minimize release of visible dust;

(iii) For measures implemented that include an enclosed cab or booth, ensure that the enclosed cab or booth:

(A) Is maintained as free as practicable from settled dust;

(B) Has door seals and closing mechanisms that work properly;

(C) Has gaskets and seals that are in good condition and working properly;

(D) Is under positive pressure maintained through continuous delivery of fresh air;

(E) Has intake air that is filtered through a filter that is 95% efficient in the 0.3–10.0 μm range (e.g., MERV-16 or better); and

(F) Has heating and cooling capabilities.

(3) Where an employee performs more than one task on Table 1 during the course of a shift, and the total duration of all tasks combined is more than four hours, the required respiratory protection for each task is the respiratory protection specified for more than four hours per shift. If the total duration of all tasks on Table 1 combined is less than four hours, the required respiratory protection for each task is the respiratory protection specified for less than four hours per shift.

(d) *Alternative exposure control methods.* For tasks not listed in Table 1,

or where the employer does not fully and properly implement the engineering controls, work practices, and respiratory protection described in Table 1:

(1) *Permissible exposure limit (PEL).*

The employer shall ensure that no employee is exposed to an airborne concentration of respirable crystalline silica in excess of 50 $\mu\text{g}/\text{m}^3$, calculated as an 8-hour TWA.

(2) *Exposure assessment—(i) General.* The employer shall assess the exposure of each employee who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level in accordance with either the performance option in paragraph (d)(2)(ii) or the scheduled monitoring option in paragraph (d)(2)(iii) of this section.

(ii) *Performance option.* The employer shall assess the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to respirable crystalline silica.

(iii) *Scheduled monitoring option.* (A) The employer shall perform initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area. Where several employees perform the same tasks on the same shift and in the same work area, the employer may sample a representative fraction of these employees in order to meet this requirement. In representative sampling, the employer shall sample the employee(s) who are expected to have the highest exposure to respirable crystalline silica.

(B) If initial monitoring indicates that employee exposures are below the action level, the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

(C) Where the most recent exposure monitoring indicates that employee exposures are at or above the action level but at or below the PEL, the employer shall repeat such monitoring within six months of the most recent monitoring.

(D) Where the most recent exposure monitoring indicates that employee exposures are above the PEL, the employer shall repeat such monitoring within three months of the most recent monitoring.

(E) Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the action level, the employer shall repeat such monitoring within six months of the most recent monitoring until two consecutive measurements, taken seven or more days apart, are below the action level, at which time the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring, except as otherwise provided in paragraph (d)(2)(iv) of this section.

(iv) *Reassessment of exposures.* The employer shall reassess exposures whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the action level, or when the employer has any reason to believe that new or additional exposures at or above the action level have occurred.

symptoms of respiratory disease (e.g., shortness of breath, cough, wheezing); history of tuberculosis; and smoking status and history;

(ii) A physical examination with special emphasis on the respiratory system;

(iii) A chest X-ray (a single posteroanterior radiographic projection or radiograph of the chest at full inspiration recorded on either film (no less than 14 x 17 inches and no more than 16 x 17 inches) or digital radiography systems), interpreted and classified according to the International Labour Office (ILO) International Classification of Radiographs of Pneumoconioses by a NIOSH-certified B Reader;

(iv) A pulmonary function test to include forced vital capacity (FVC) and forced expiratory volume in one second (FEV₁) and FEV₁/FVC ratio, administered by a spirometry technician with a current certificate from a NIOSH-approved spirometry course;

(v) Testing for latent tuberculosis infection; and

(vi) Any other tests deemed appropriate by the PLHCP.

(3) *Periodic examinations.* The employer shall make available medical examinations that include the procedures described in paragraph (h)(2) of this section (except paragraph (h)(2)(v)) at least every three years, or more frequently if recommended by the PLHCP.

(4) *Information provided to the PLHCP.* The employer shall ensure that the examining PLHCP has a copy of this standard, and shall provide the PLHCP with the following information:

(i) A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to respirable crystalline silica;

(ii) The employee's former, current, and anticipated levels of occupational exposure to respirable crystalline silica;

(iii) A description of any personal protective equipment used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and

(iv) Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the employer.

(5) *PLHCP's written medical report for the employee.* The employer shall ensure that the PLHCP explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of each medical

examination performed. The written report shall contain:

(i) A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica and any medical conditions that require further evaluation or treatment;

(ii) Any recommended limitations on the employee's use of respirators;

(iii) Any recommended limitations on the employee's exposure to respirable crystalline silica; and

(iv) A statement that the employee should be examined by a specialist (pursuant to paragraph (h)(7) of this section) if the chest X-ray provided in accordance with this section is classified as 1/0 or higher by the B Reader, or if referral to a specialist is otherwise deemed appropriate by the PLHCP.

(6) *PLHCP's written medical opinion for the employer.* (i) The employer shall obtain a written medical opinion from the PLHCP within 30 days of the medical examination. The written opinion shall contain only the following:

(A) The date of the examination;

(B) A statement that the examination has met the requirements of this section; and

(C) Any recommended limitations on the employee's use of respirators.

(ii) If the employee provides written authorization, the written opinion shall also contain either or both of the following:

(A) Any recommended limitations on the employee's exposure to respirable crystalline silica;

(B) A statement that the employee should be examined by a specialist (pursuant to paragraph (h)(7) of this section) if the chest X-ray provided in accordance with this section is classified as 1/0 or higher by the B Reader, or if referral to a specialist is otherwise deemed appropriate by the PLHCP.

(iii) The employer shall ensure that each employee receives a copy of the written medical opinion described in paragraph (h)(6)(i) and (ii) of this section within 30 days of each medical examination performed.

(7) *Additional examinations.* (i) If the PLHCP's written medical opinion indicates that an employee should be examined by a specialist, the employer shall make available a medical examination by a specialist within 30 days after receiving the PLHCP's written opinion.

(ii) The employer shall ensure that the examining specialist is provided with

all of the information that the employer is obligated to provide to the PLHCP in accordance with paragraph (h)(4) of this section.

(iii) The employer shall ensure that the specialist explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of the examination. The written report shall meet the requirements of paragraph (h)(5) (except paragraph (h)(5)(iv)) of this section.

(iv) The employer shall obtain a written opinion from the specialist within 30 days of the medical examination. The written opinion shall meet the requirements of paragraph (h)(6) (except paragraph (h)(6)(i)(B) and (ii)(B)) of this section.

(i) *Communication of respirable crystalline silica hazards to employees—(1) Hazard communication.* The employer shall include respirable crystalline silica in the program established to comply with the hazard communication standard (HCS) (29 CFR 1910.1200). The employer shall ensure that each employee has access to labels on containers of crystalline silica and safety data sheets, and is trained in accordance with the provisions of HCS and paragraph (i)(2) of this section. The employer shall ensure that at least the following hazards are addressed: Cancer, lung effects, immune system effects, and kidney effects.

(2) *Employee information and training.* (i) The employer shall ensure that each employee covered by this section can demonstrate knowledge and understanding of at least the following:

(A) The health hazards associated with exposure to respirable crystalline silica;

(B) Specific tasks in the workplace that could result in exposure to respirable crystalline silica;

(C) Specific measures the employer has implemented to protect employees from exposure to respirable crystalline silica, including engineering controls, work practices, and respirators to be used;

(D) The contents of this section;

(E) The identity of the competent person designated by the employer in accordance with paragraph (g)(4) of this section; and

(F) The purpose and a description of the medical surveillance program required by paragraph (h) of this section.

(ii) The employer shall make a copy of this section readily available without cost to each employee covered by this section.

(j) *Recordkeeping—(1) Air monitoring data.* (i) The employer shall make and

and because they are caused by substantial overexposures to respirable crystalline silica. Although any case of silicosis indicates a breakdown in prevention, a case of acute or accelerated silicosis implies current high exposure and a very marked breakdown in prevention.

In addition to silicosis, employees exposed to respirable crystalline silica, especially those with accelerated or acute silicosis, are at increased risks of contracting active TB and other infections (ATS 1997; Rees and Murray 2007). Exposure to respirable crystalline silica also increases an employee's risk of developing lung cancer, and the higher the cumulative exposure, the higher the risk (Steenland *et al.* 2001; Steenland and Ward 2014). Symptoms for these diseases and other respirable crystalline silica-related diseases are discussed below.

1.2. Chronic Silicosis. Chronic silicosis is the most common presentation of silicosis and usually occurs after at least 10 years of exposure to respirable crystalline silica. The clinical presentation of chronic silicosis is:

1.2.1. Symptoms—shortness of breath and cough, although employees may not notice any symptoms early in the disease. Constitutional symptoms, such as fever, loss of appetite and fatigue, may indicate other diseases associated with silica exposure, such as TB infection or lung cancer. Employees with these symptoms should immediately receive further evaluation and treatment.

1.2.2. Physical Examination—may be normal or disclose dry rales or rhonchi on lung auscultation.

1.2.3. Spirometry—may be normal or may show only a mild restrictive or obstructive pattern.

1.2.4. Chest X-ray—classic findings are small, rounded opacities in the upper lung fields bilaterally. However, small irregular opacities and opacities in other lung areas can also occur. Rarely, "eggshell calcifications" in the hilar and mediastinal lymph nodes are seen.

1.2.5. Clinical Course—chronic silicosis in most cases is a slowly progressive disease. Under the respirable crystalline silica standard, the PLHCP is to recommend that employees with a 1/0 category X-ray be referred to an American Board Certified Specialist in Pulmonary Disease or Occupational Medicine. The PLHCP and/or Specialist should counsel employees regarding work practices and personal habits that could affect employees' respiratory health.

1.3. Accelerated Silicosis. Accelerated silicosis generally occurs within 5–10 years of exposure and results from high levels of exposure to respirable crystalline silica. The clinical presentation of accelerated silicosis is:

1.3.1. Symptoms—shortness of breath, cough, and sometimes sputum production. Employees with exposure to respirable crystalline silica, and especially those with accelerated silicosis, are at high risk for activation of TB infections, atypical mycobacterial infections, and fungal superinfections. Constitutional symptoms, such as fever, weight loss, hemoptysis (coughing up blood), and fatigue may herald

one of these infections or the onset of lung cancer.

1.3.2. Physical Examination—rales, rhonchi, or other abnormal lung findings in relation to illnesses present. Clubbing of the digits, signs of heart failure, and cor pulmonale may be present in severe lung disease.

1.3.3. Spirometry—restrictive or mixed restrictive/obstructive pattern.

1.3.4. Chest X-ray—small rounded and/or irregular opacities bilaterally. Large opacities and lung abscesses may indicate infections, lung cancer, or progression to complicated silicosis, also termed progressive massive fibrosis.

1.3.5. Clinical Course—accelerated silicosis has a rapid, severe course. Under the respirable crystalline silica standard, the PLHCP can recommend referral to a Board Certified Specialist in either Pulmonary Disease or Occupational Medicine, as deemed appropriate, and referral to a Specialist is recommended whenever the diagnosis of accelerated silicosis is being considered.

1.4. Acute Silicosis. Acute silicosis is a rare disease caused by inhalation of extremely high levels of respirable crystalline silica particles. The pathology is similar to alveolar proteinosis with lipoproteinaceous material accumulating in the alveoli. Acute silicosis develops rapidly, often, within a few months to less than 2 years of exposure, and is almost always fatal. The clinical presentation of acute silicosis is as follows:

1.4.1. Symptoms—sudden, progressive, and severe shortness of breath. Constitutional symptoms are frequently present and include fever, weight loss, fatigue, productive cough, hemoptysis (coughing up blood), and pleuritic chest pain.

1.4.2. Physical Examination—dyspnea at rest, cyanosis, decreased breath sounds, inspiratory rales, clubbing of the digits, and fever.

1.4.3. Spirometry—restrictive or mixed restrictive/obstructive pattern.

1.4.4. Chest X-ray—diffuse haziness of the lungs bilaterally early in the disease. As the disease progresses, the "ground glass" appearance of interstitial fibrosis will appear.

1.4.5. Clinical Course—employees with acute silicosis are at especially high risk of TB activation, nontuberculous mycobacterial infections, and fungal superinfections. Acute silicosis is immediately life-threatening. The employee should be urgently referred to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine for evaluation and treatment. Although any case of silicosis indicates a breakdown in prevention, a case of acute or accelerated silicosis implies a profoundly high level of silica exposure and may mean that other employees are currently exposed to dangerous levels of silica.

1.5. COPD. COPD, including chronic bronchitis and emphysema, has been documented in silica-exposed employees, including those who do not develop silicosis. Periodic spirometry tests are performed to evaluate each employee for progressive changes consistent with the development of COPD. In addition to evaluating spirometry results of individual employees over time,

PLHCPs may want to be aware of general trends in spirometry results for groups of employees from the same workplace to identify possible problems that might exist at that workplace. (See Section 2 of this Appendix on Medical Surveillance for further discussion.) Heart disease may develop secondary to lung diseases such as COPD. A recent study by Liu *et al.* 2014 noted a significant exposure-response trend between cumulative silica exposure and heart disease deaths, primarily due to pulmonary heart disease, such as cor pulmonale.

1.6. Renal and Immune System. Silica exposure has been associated with several types of kidney disease, including glomerulonephritis, nephrotic syndrome, and end stage renal disease requiring dialysis. Silica exposure has also been associated with other autoimmune conditions, including progressive systemic sclerosis, systemic lupus erythematosus, and rheumatoid arthritis. Studies note an association between employees with silicosis and serologic markers for autoimmune diseases, including antinuclear antibodies, rheumatoid factor, and immune complexes (Jalloul and Banks 2007; Shtraichman *et al.* 2015).

1.7. TB and Other Infections. Silica-exposed employees with latent TB are 3 to 30 times more likely to develop active pulmonary TB infection (ATS 1997; Rees and Murray 2007). Although respirable crystalline silica exposure does not cause TB infection, individuals with latent TB infection are at increased risk for activation of disease if they have higher levels of respirable crystalline silica exposure, greater profusion of radiographic abnormalities, or a diagnosis of silicosis. Demographic characteristics, such as immigration from some countries, are associated with increased rates of latent TB infection. PLHCPs can review the latest Centers for Disease Control and Prevention (CDC) information on TB incidence rates and high risk populations online (See Section 5 of this Appendix). Additionally, silica-exposed employees are at increased risk for contracting nontuberculous mycobacterial infections, including *Mycobacterium avium-intracellulare* and *Mycobacterium kansasii*.

1.8. Lung Cancer. The National Toxicology Program has listed respirable crystalline silica as a known human carcinogen since 2000 (NTP 2014). The International Agency for Research on Cancer (2012) has also classified silica as Group 1 (carcinogenic to humans). Several studies have indicated that the risk of lung cancer from exposure to respirable crystalline silica and smoking is greater than additive (Brown 2009; Liu *et al.* 2013). Employees should be counseled on smoking cessation.

2. Medical Surveillance

PLHCPs who manage silica medical surveillance programs should have a thorough understanding of the many silica-related diseases and health effects outlined in Section 1 of this Appendix. At each clinical encounter, the PLHCP should consider silica-related health outcomes, with particular vigilance for acute and accelerated silicosis. In this Section, the required components of

employee reports a history of abnormal kidney function tests, the PLHCP may want to order a baseline renal function tests (e.g., serum creatinine and urinalysis). As indicated above, the PLHCP may order annual TB testing for silica-exposed employees who are at high risk of developing active TB infections. Additional tests that PLHCPs may order based on findings of medical examinations include, but is not limited to, chest computerized tomography (CT) scan for lung cancer or COPD, testing for immunologic diseases, and cardiac testing for pulmonary-related heart disease, such as cor pulmonale.

3. Roles and Responsibilities

3.1. PLHCP. The PLHCP designation refers to "an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required" by the respirable crystalline silica standard. The legally permitted scope of practice for the PLHCP is determined by each State. PLHCPs who perform clinical services for a silica medical surveillance program should have a thorough knowledge of respirable crystalline silica-related diseases and symptoms. Suspected cases of silicosis, advanced COPD, or other respiratory conditions causing impairment should be promptly referred to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine.

Once the medical surveillance examination is completed, the employer must ensure that the PLHCP explains to the employee the results of the medical examination and provides the employee with a written medical report within 30 days of the examination. The written medical report must contain a statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica and any medical conditions that require further evaluation or treatment. In addition, the PLHCP's written medical report must include any recommended limitations on the employee's use of respirators, any recommended limitations on the employee's exposure to respirable crystalline silica, and a statement that the employee should be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine if the chest X-ray is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate by the PLHCP.

The PLHCP should discuss all findings and test results and any recommendations regarding the employee's health, worksite safety and health practices, and medical referrals for further evaluation, if indicated. In addition, it is suggested that the PLHCP offer to provide the employee with a complete copy of their examination and test results, as some employees may want this information for their own records or to provide to their personal physician or a future PLHCP. Employees are entitled to access their medical records.

Under the respirable crystalline silica standard, the employer must ensure that the

PLHCP provides the employer with a written medical opinion within 30 days of the employee examination, and that the employee also gets a copy of the written medical opinion for the employer within 30 days. The PLHCP may choose to directly provide the employee a copy of the written medical opinion. This can be particularly helpful to employees, such as construction employees, who may change employers frequently. The written medical opinion can be used by the employee as proof of up-to-date medical surveillance. The following lists the elements of the written medical report for the employee and written medical opinion for the employer. (Sample forms for the written medical report for the employee, the written medical opinion for the employer, and the written authorization are provided in Section 7 of this Appendix.)

3.1.1. The written medical report for the employee must include the following information:

3.1.1.1. A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica and any medical conditions that require further evaluation or treatment;

3.1.1.2. Any recommended limitations upon the employee's use of a respirator;

3.1.1.3. Any recommended limitations on the employee's exposure to respirable crystalline silica; and

3.1.1.4. A statement that the employee should be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine, where the standard requires or where the PLHCP has determined such a referral is necessary. The standard requires referral to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine for a chest X-ray B reading indicating small opacities in a profusion of 1/0 or higher, or if the PLHCP determines that referral to a Specialist is necessary for other silica-related findings.

3.1.2. The PLHCP's written medical opinion for the employer must include only the following information:

3.1.2.1. The date of the examination;

3.1.2.2. A statement that the examination has met the requirements of this section; and

3.1.2.3. Any recommended limitations on the employee's use of respirators.

3.1.2.4. If the employee provides the PLHCP with written authorization, the written opinion for the employer shall also contain either or both of the following:

(1) Any recommended limitations on the employee's exposure to respirable crystalline silica; and

(2) A statement that the employee should be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine if the chest X-ray provided in accordance with this section is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate.

3.1.2.5. In addition to the above referral for abnormal chest X-ray, the PLHCP may refer an employee to a Board Certified Specialist in Pulmonary Disease or Occupational

Medicine for other findings of concern during the medical surveillance examination if these findings are potentially related to silica exposure.

3.1.2.6. Although the respirable crystalline silica standard requires the employer to ensure that the PLHCP explains the results of the medical examination to the employee, the standard does not mandate how this should be done. The written medical opinion for the employer could contain a statement that the PLHCP has explained the results of the medical examination to the employee.

3.2. Medical Specialists. The silica standard requires that all employees with chest X-ray B readings of 1/0 or higher be referred to a Board Certified Specialist in Pulmonary Disease or Occupational Medicine. If the employee has given written authorization for the employer to be informed, then the employer shall make available a medical examination by a Specialist within 30 days after receiving the PLHCP's written medical opinion.

3.2.1. The employer must provide the following information to the Board Certified Specialist in Pulmonary Disease or Occupational Medicine:

3.2.1.1. A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to respirable crystalline silica;

3.2.1.2. The employee's former, current, and anticipated levels of occupational exposure to respirable crystalline silica;

3.2.1.3. A description of any personal protective equipment used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and

3.2.1.4. Information from records of employment-related medical examinations previously provided to the employee and currently within the control of the employer.

3.2.2. The PLHCP should make certain that, with written authorization from the employee, the Board Certified Specialist in Pulmonary Disease or Occupational Medicine has any other pertinent medical and occupational information necessary for the specialist's evaluation of the employee's condition.

3.2.3. Once the Board Certified Specialist in Pulmonary Disease or Occupational Medicine has evaluated the employee, the employer must ensure that the Specialist explains to the employee the results of the medical examination and provides the employee with a written medical report within 30 days of the examination. The employer must also ensure that the Specialist provides the employer with a written medical opinion within 30 days of the employee examination. (Sample forms for the written medical report for the employee, the written medical opinion for the employer, and the written authorization are provided in Section 7 of this Appendix.)

3.2.4. The Specialist's written medical report for the employer must include the following information:

3.2.4.1. A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to

- NIOSH B Reader Program Web page. (Information on interpretation of X-rays for silicosis and a list of certified B-readers). Accessed at: <http://www.cdc.gov/niosh/topics/chestradiography/breader-info.html>
- NIOSH Guideline (2011). Application of Digital Radiography for the Detection and Classification of Pneumoconiosis. NIOSH publication number 2011-198. Accessed at: <http://www.cdc.gov/niosh/docs/2011-198/>
- NIOSH Hazard Review (2002). Health Effects of Occupational Exposure to Respirable Crystalline Silica. NIOSH publication number 2002-129. Accessed at: <http://www.cdc.gov/niosh/docs/2002-129/>
- NIOSH Health Hazard Evaluations Programs. (Information on the NIOSH Health Hazard Evaluation (HHE) program, how to request an HHE and how to look up an HHE report). Accessed at: <http://www.cdc.gov/niosh/hhe/>
- 5.5. National Industrial Sand Association: Occupational Health Program for Exposure to Crystalline Silica in the Industrial Sand Industry. National Industrial Sand Association, 2nd ed. 2010. Can be ordered at: <http://www.sand.org/silica-occupational-health-program>
- 5.6. Occupational Safety and Health Administration (OSHA)
- Contacting OSHA: http://www.osha.gov/html/Feed_Back.html
- OSHA's Clinicians Web page. (OSHA resources, regulations and links to help clinicians navigate OSHA's Web site and aid clinicians in caring for workers.) Accessed at: <http://www.osha.gov/dts/oom/clinicians/index.html>
- OSHA's Safety and Health Topics Web page on Silica. Accessed at: <http://www.osha.gov/dsg/topics/silicacrystalline/index.html>
- OSHA (2013). Spirometry Testing in Occupational Health Programs: Best Practices for Healthcare Professionals. (OSHA 3637-03 2013). Accessed at: <http://www.osha.gov/Publications/OSHA3637.pdf>
- OSHA/NIOSH (2011). Spirometry: OSHA/NIOSH Spirometry InfoSheet (OSHA 3415-1-11). (Provides guidance to employers). Accessed at: <http://www.osha.gov/Publications/osh3415.pdf>
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- 5.7. Other
- Steenland, K. and Ward E. (2014). Silica: A lung carcinogen. *CA Cancer J Clin*, 64, 63-69. (This article reviews not only silica and lung cancer but also all the known silica-related health effects. Further, the authors provide guidance to clinicians on medical surveillance of silica-exposed workers and worker counselling on safety practices to minimize silica exposure.)
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7. Sample Forms
- Three sample forms are provided. The first is a sample written medical report for the employee. The second is a sample written medical opinion for the employer. And the third is a sample written authorization form that employees sign to clarify what information the employee is authorizing to be released to the employer.
- BILLING CODE 4510-26-P

WRITTEN MEDICAL OPINION FOR EMPLOYER**EMPLOYER:** _____**EMPLOYEE NAME:** _____ **DATE OF EXAMINATION:** _____**TYPE OF EXAMINATION:**☐ Initial examination ☐ Periodic examination ☐ Specialist examination
☐ Other: _____**USE OF RESPIRATOR:**☐ No limitations on respirator use
☐ Recommended limitations on use of respirator: _____Dates for recommended limitations, if applicable: _____ to _____
MM/DD/YYYY MM/DD/YYYY

The employee has provided written authorization for disclosure of the following to the employer (if applicable):

☐ This employee should be examined by an American Board Certified Specialist in Pulmonary Disease or Occupational Medicine
☐ Recommended limitations on exposure to respirable crystalline silica: _____Dates for exposure limitations noted above: _____ to _____
MM/DD/YYYY MM/DD/YYYY**NEXT PERIODIC EVALUATION:** ☐ 3 years ☐ Other: _____
MM/DD/YYYY

Examining Provider: _____ Date: _____

(signature)

Provider Name: _____ Provider's specialty: _____

Office Address: _____ Office Phone: _____

☐ I attest that the results have been explained to the employee.**The following is required to be checked by the Physician or other Licensed Health Care Professional (PLHCP):**☐ I attest that this medical examination has met the requirements of the medical surveillance section of the OSHA Respirable Crystalline Silica standard (§ 1910.1053(h) or 1926.1153(h)).